Electrical Circuits (2)

Sheet 4 - Natural RLC parallel circuits

1. The circuit elements in the circuit in Fig. 1 are R = 200 ohm, C = 200 nF, and L = 50 mH. The initial inductor current is - 45 mA, and the initial capacitor voltage is 15 V.

   a) Calculate the initial current in each branch of the circuit.

   b) Find v (t) for t > 0.

   c) Find I_L (t) for t > 0.

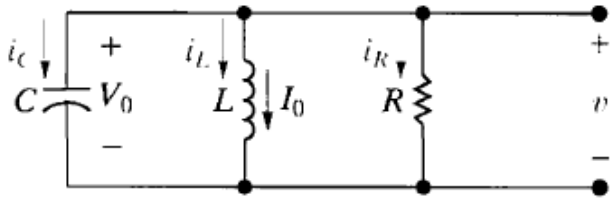

Fig. 1

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2. The initial value of the voltage *v* in the circuit in Fig. 1 is zero, and the initial value of the capacitor current i_c (0+), is 45 mA. The expression for the capacitor current is known to be

$$i_c(t) = A_1 e^{-200t} + A_2 e^{-800t} \quad t > 0^+,$$

And *R* is 250 ohm. Find

a) The values of α, ω_0, *L*, C, A_1 and A_2.
b) The expression for v(t), t ≥ 0,
c) The expression for $i_R(t) \geq 0$,
d) The expression for $i_L(t) \geq 0$.

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3. The two switches in the circuit seen in Fig.2 operate synchronously. When switch 1 is in position a, switch 2 is in position d. When switch 1 moves to position b, switch 2 moves to position c. Switch 1 has been in position a for a long time. At *t* = 0, the switches move to their alternate positions. Find $v_0(t)$ for $t \geq 0$.

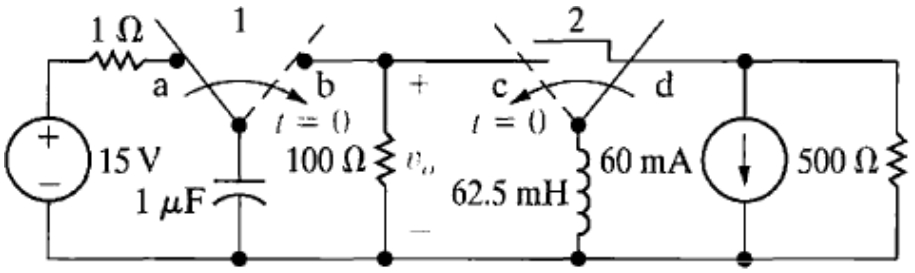

Fig. 2